UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/957,046	09/20/2001	Young-Hoon Joo	5000-1-211	3172

33942 7590 05/31/2005

CHA & REITER, LLC
210 ROUTE 4 EAST STE 103
PARAMUS, NJ 07652

EXAMINER	
LEUNG, CHRISTINA Y	

ART UNIT	PAPER NUMBER
2633	

DATE MAILED: 05/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

8m

Office Action Summary	Application No.	Applicant(s)
	09/957,046	JOO ET AL.
	Examiner	Art Unit
	Christina Y. Leung	2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 15 October 2004.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-12 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-12 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 02 Sept. 2004.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments and Allowable Subject Matter

1. Applicants' arguments, see pages 8 and 9, filed 15 October 2004, with respect to the rejection(s)of claim(s) 1 and 5 under Terahara (US 6,211,980 B1) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Kai et al. (US 6,278,536 B1) and Giles (US 5,633,741 A).

2. The indicated allowability of claims 2-4 and 6-9 is withdrawn in view of the newly discovered reference(s) to Kai et al. and Giles. Rejections based on the newly cited reference(s) follow.

3. This Office Action also includes new rejections of claims 3 and 8 under 35 U.S.C. 112, second paragraph.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 3 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 3 recites "said reverse optical signal outputted at the first node of said second interleaver" in lines 3 and 4 of the claim. However, there is insufficient antecedent basis for this limitation in the claim because claim 2, on which claim 3 depends, does not recite that the second interleaver has a "first" node. Examiner respectfully suggests that the word "first" in this

phrase should be changed to "fifth" (since claim 2 recites that the reverse signal is outputted from the fifth node).

Also, claim 3 further recites "said forward optical signal output at the fifth node of said second interleaver" in lines 6 and 7 of the claim. However, claim 2 recites that the forward signal is outputted from the fourth node of the second interleaver (not the fifth node, which outputs the reverse signal). Examiner respectfully suggests that the word "fifth" in this phrase should be changed to "fourth."

Similarly, claim 8 recites "said reverse optical signal outputted at the first node of said second interleaver" in lines 15 and 16 of the claim. There is insufficient antecedent basis for this limitation in the claim because claim 8 does not previously recite that the second interleaver has a "first" node. Again, Examiner respectfully suggests that the word "first" in this phrase should be changed to "fifth" (since claim 8 recites that the reverse signal is outputted from the fifth node).

Claim 8 also recites "said forward optical signal output at the fifth node of said second interleaver" in lines 17 and 18 of the claim. Again, Examiner respectfully suggests that the word "fifth" in this phrase should be changed to "fourth" because the claim recites that the forward signal is outputted from the fourth node of the second interleaver.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kai et al. (US 6,278,536 B1) in view of Giles (US 5,633,741 A).

Regarding claim 1, Kai et al. disclose a bi-directional add/drop multiplexer for transmitting a wavelength division multiplexed signal through an optical fiber in both forward and reverse directions at each node in a WDM network system (Figures 1 and 2; see also Figure 23), the ADM comprising:

a multiplexer (optical coupler 20; column 17, lines 12-31);

a demultiplexer (optical coupler 21; column 17, lines 12-31);

a means for adding and dropping bi-directional signals (ADM unit 105 in uni-directional optical ADM 1, shown in detail in Figure 2; column 20, lines 5-13);

wherein the channels of the forward direction and the reverse direction are multiplexed, the multiplexed optical signals are added/dropped according to channels, and the added/dropped bi-directional signals are demultiplexed into a forward optical signal and a reverse optical signal (column 17, lines 23-31; column 18, lines 4-14; column 20, lines 5-55).

Examiner notes that Figure 1 actually shows two sets of forward and reverse optical signals (four multiplexed signals total, two for "work" and two for "protection"). However, the bidirectional "work" signals alone disclosed by Kai et al. comprise the forward and reverse optical signals recited in the claims.

Examiner also notes that Kai et al. label element 1 as a "uni-directional optical ADM" specifically because the optical signal processing within that particular element occurs in a single direction (column 16, lines 38-60); however, the system as a whole shown in Figure 1 would be

clearly understood in the art as a "bi-directional add/drop multiplexer," since the signals from both directions are subjected to adding and dropping.

Regarding claim 10 in particular, Kai et al. disclose that the channels of the forward and the reverse direction are multiplexer by multiplexer 20 onto a path toward the demultiplexer 21.

Regarding claims 1 and 10, Kai et al. disclose that the forward optical signal comprise a group of wavelengths such as λ1-λ4 while the reverse optical signals comprise a group of wavelengths such as λ5-λ8 (column 16, lines 61-67) and disclose that the signals are combined and uncombined using multiplexer 20 and demultiplexer 21. They do not specifically disclose that the signals may be combined and uncombined using an interleaver and a de-interleaver instead.

However, Giles teaches a bi-directional optical WDM communication system related to the one disclosed by Kai et al. including transmitting a wavelength division multiplexed signal through an optical fiber in both forward and reverse directions (Figure 1; column 4, lines 50-63). Giles further teaches interleaving the forward and reverse signals such that the forward signal comprises the "odd" wavelength channels and the reverse signal comprises the "even" wavelength channels instead of dividing the channels into two halves in the way disclosed by Kai et al (Giles, Figure 6; column 6, lines 8-11; column 7, lines 29-42). Regarding claims 11 and 12 in particular, Giles teaches that the channels are interleaved as to wavelength.

Regarding claims 1 and 10-12, it would have been obvious to a person of ordinary skill in the art to interleave the forward and reverse signals as taught by Giles in the system disclosed by Kai et al. (and accordingly use an interleaver and a de-interleaver in place of the multiplexer and demultiplexer) in order to provide greater spacing between the channels in either direction and

thereby reduce negative effects of four wave mixing and facilitate filtering requirements at the receiving end (see Giles, column 6, lines 8-11; column 7, lines 29-42).

Regarding claim 2, Kai et al. disclose a bi-directional add/drop multiplexer for transmitting a wavelength division multiplexed signal through an optical fiber in both forward and reverse directions at each node in a WDM network system (Figures 1 and 2; see also Figure 23), the ADM comprising:

a means for adding and dropping bi-directional signals (Figure 1);

wherein the channels of the forward direction and the reverse direction are multiplexed, the multiplexed optical signals are added/dropped according to channels and the added/dropped bi-directional signals are de multiplexed into a forward optical signal and a reverse optical signal, further comprising:

a first multiplexer (optical coupler 20; column 17, lines 12-31) having a first node, a second node, and a third node for multiplexing the forward optical signal (i.e., the left-to-right "work" signal having wavelengths λ1-λ4 shown in Figure 1) received at the first node and the reverse optical signal (i.e., the right-to-left "work" signal having wavelengths λ5-λ8) received at the second node, and for outputting the multiplexed forward and reverse optical signals through the third node;

an add/drop multiplexer (including ADM unit 105 in uni-directional optical ADM 1, shown in detail in Figure 2; column 20, lines 5-13), for adding and dropping a selected channel to/from the multiplexed forward and reverse optical signals outputted from the first multiplexer; and

a second multiplexer (optical coupler 21; column 17, lines 12-31) having a fourth node and a fifth node for demultiplexing optical signals outputted from the add/drop multiplexer into the forward optical signal and the reverse optical signal according to the channels, and for outputting the demultiplexed forward optical signal and the demultiplexed reverse optical signal to the fourth and fifth nodes, respectively.

Again, Kai et al. disclose that the forward optical signal comprises a group of wavelengths such as $\lambda 1$-$\lambda 4$ while the reverse optical signal comprises a group of wavelengths such as $\lambda 5$-$\lambda 8$ (column 16, lines 61-67) and disclose that the signals are combined and uncombined using first multiplexer 20 and second multiplexer 21. They do not specifically disclose that the signals may be combined and uncombined using a first interleaver and a second interleaver (i.e., a de-interleaver) instead.

However, Giles teaches a bi-directional optical WDM communication system related to the one disclosed by Kai et al. including transmitting a wavelength division multiplexed signal through an optical fiber in both forward and reverse directions (Figure 1; column 4, lines 50-63). Giles further teaches interleaving the forward and reverse signals such that the forward signal comprises the "odd" wavelength channels and the reverse signal comprises the "even" wavelength channels instead of dividing the channels into two halves in the way disclosed by Kai et al (Giles, Figure 6; column 6, lines 8-11; column 7, lines 29-42).

Regarding claim 2, it would have been obvious to a person of ordinary skill in the art to interleave the forward and reverse signals as taught by Giles in the system disclosed by Kai et al. (and accordingly use first and second interleavers in place of the mutliplexers) in order to provide greater spacing between the channels in either direction and thereby reduce negative

effects of four wave mixing and facilitate filtering requirements at the receiving end (see Giles, column 6, lines 8-11; column 7, lines 29-42).

Regarding claim 3, as well as the claim may be understood with respect to 35 U.S.C. 112, discussed above, Kai et al. further disclose

a first optical circulator 22 for providing the forward optical signal to the first node of the first multiplexer 20 and for providing the reverse optical signal outputted at the fifth node of the second multiplexer 21 to the optical fiber; and

a second optical circulator 23 for providing the reverse optical signal to the second node of the first multiplexer 20 and for providing the forward optical signal output at the fourth node of the second multiplexer 21 to the optical fiber (column 17, lines 33-45).

Regarding claim 5, Kai et al. disclose a bi-directional WDM optical transmission system comprising:

first and second transceivers for multiplexing a multi-channel optical signal before transmission and de-multiplexing a received multi-channel optical signal (Figure 23; column 14, lines 66-67; column 15, lines 1-35); and

a bi-directional WDM-ADM (Figure 1) for multiplexing (using optical coupler 20) optical signal channels received from the first transceiver (not explicitly shown in Figure 1, but may be considered as being located on the left side beyond the figure) and optical signal channels received from the second transceiver (on the right side of Figure 1), for adding/dropping the multiplexed optical signals according to channels (using ADM unit 105 in uni-directional optical ADM 1, shown in detail in Figure 2; column 20, lines 5-13), for demultiplexing (using optical coupler 21) the added/dropped optical signals into a first optical

signal and a second optical signal, and providing the first and the second optical signals to the first and second transceivers, respectively.

Examiner notes that Figures 1 and 23 actually show two sets of forward and reverse optical signals (four multiplexed signals total, two for "work" and two for "protection"). However, the bidirectional "work" signals alone disclosed by Kai et al. in Figure 1 comprise the forward and reverse optical signals recited in the claims.

Again, Kai et al. disclose that the forward optical signal comprises a group of wavelengths such as λ1-λ4 while the reverse optical signal comprises a group of wavelengths such as λ5-λ8 (column 16, lines 61-67) and disclose that the signals are combined and uncombined using first multiplexer 20 and second multiplexer 21. They do not specifically disclose that the signals may be combined and uncombined using a first interleaver and a second interleaver (i.e., a de-interleaver) instead.

However, Giles teaches a bi-directional optical WDM communication system related to the one disclosed by Kai et al. including transmitting a wavelength division multiplexed signal through an optical fiber in both forward and reverse directions (Figure 1; column 4, lines 50-63). Giles further teaches interleaving the forward and reverse signals such that the forward signal comprises the "odd" wavelength channels and the reverse signal comprises the "even" wavelength channels instead of dividing the channels into two halves in the way disclosed by Kai et al (Giles, Figure 6; column 6, lines 8-11; column 7, lines 29-42).

Regarding claim 5, it would have been obvious to a person of ordinary skill in the art to interleave the forward and reverse signals as taught by Giles in the system disclosed by Kai et al. (and accordingly use an interleaver and a de-interleaver in place of the multiplexer and

demultiplexer) in order to provide greater spacing between the channels in either direction and thereby reduce negative effects of four wave mixing and facilitate filtering requirements at the receiving end (see Giles, column 6, lines 8-11; column 7, lines 29-42).

Regarding claim 6, Kai et al. further discloses that the system comprises:

a first multiplexer (optical coupler 20; column 17, lines 12-31) having a first node, a second node, and a third node for multiplexing the forward optical signal (i.e., the left-to-right "work" signal having wavelengths λ1-λ4 shown in Figure 1) received at the first node and the reverse optical signal (i.e., the right-to-left "work" signal having wavelengths λ5-λ8) received at the second node, and for outputting the multiplexed forward and reverse optical signals through the third node;

an add/drop multiplexer (including ADM unit 105 in uni-directional optical ADM 1, shown in detail in Figure 2; column 20, lines 5-13), for adding and dropping a selected channel to/from the multiplexed forward and reverse optical signals outputted from the first multiplexer; and

a second multiplexer (optical coupler 21; column 17, lines 12-31) having a fourth node and a fifth node for demutliplexing optical signals outputted from the add/drop multiplexer into the forward optical signal and the reverse optical signal according to the channels, and for outputting the demultiplexed forward optical signal and the demultiplexed reverse optical signal to the fourth and fifth nodes, respectively.

Again, Kai et al. do not specifically disclose that the signals may be combined and uncombined using a first interleaver and a second interleaver (i.e., a de-interleaver) instead. However, Giles teaches interleaving the forward and reverse signals such that the forward signal

comprises the "odd" wavelength channels and the reverse signal comprises the "even" wavelength channels instead of dividing the channels into two halves in the way disclosed by Kai et al (Giles, Figure 6; column 6, lines 8-11; column 7, lines 29-42).

Regarding claim 6, it would have been obvious to a person of ordinary skill in the art to interleave the forward and reverse signals as taught by Giles in the system disclosed by Kai et al. (and accordingly use first and second interleavers in place of the multiplexers) in order to provide greater spacing between the channels in either direction and thereby reduce negative effects of four wave mixing and facilitate filtering requirements at the receiving end (see Giles, column 6, lines 8-11; column 7, lines 29-42).

Regarding claim 8, as well as the claim may be understood with respect to 35 U.S.C. 112, discussed above, Kai et al. disclose a bi-directional WDM optical transmission system (Figures 1, 2, and 23) comprising:

first and second transceivers for multiplexing a multi-channel optical signal before transmission and de-multiplexing a received multi-channel optical signal (Figure 23); and

a WDM-ADM (Figures 1 and 2) comprising:

a first multiplexer (optical coupler 20; column 17, lines 12-31) having a first node, a second node, and a third node for multiplexing the forward optical signal (i.e., the left-to-right "work" signal having wavelengths $\lambda 1$-$\lambda 4$ shown in Figure 1) received at the first node and the reverse optical signal (i.e., the right-to-left "work" signal having wavelengths $\lambda 5$-$\lambda 8$) received at the second node, and for outputting the multiplexed forward and reverse optical signals through the third node;

an add/drop multiplexer (including ADM unit 105 in uni-directional optical ADM 1, shown in detail in Figure 2; column 20, lines 5-13), for adding and dropping a selected channel to/from the multiplexed forward and reverse optical signals outputted from the first multiplexer; and

a second multiplexer (optical coupler 21; column 17, lines 12-31) having a fourth node and a fifth node for demultiplexing optical signals outputted from the add/drop multiplexer into the forward optical signal and the reverse optical signal according to the channels, and for outputting the demultiplexed forward optical signal and the demultiplexed reverse optical signal to the fourth and fifth nodes, respectively;

a first optical circulator 22 for providing the forward optical signal to the first node of the first multiplexer 20 and for providing the reverse optical signal outputted at the fifth node of the second multiplexer 21 to the optical fiber; and

a second optical circulator 23 for providing the reverse optical signal to the second node of the first multiplexer 20 and for providing the forward optical signal output at the fourth node of the second multiplexer 21 to the optical fiber (column 17, lines 33-45).

Again, Kai et al. disclose that the forward optical signal comprises a group of wavelengths such as $\lambda 1$-$\lambda 4$ while the reverse optical signal comprises a group of wavelengths such as $\lambda 5$-$\lambda 8$ (column 16, lines 61-67) and disclose that the signals are combined and uncombined using first multiplexer 20 and second multiplexer 21. They do not specifically disclose that the signals may be combined and uncombined using a first interleaver and a second interleaver (i.e., a de-interleaver) instead.

However, Giles teaches a bi-directional optical WDM communication system related to the one disclosed by Kai et al. including transmitting a wavelength division multiplexed signal through an optical fiber in both forward and reverse directions (Figure 1; column 4, lines 50-63). Giles further teaches interleaving the forward and reverse signals such that the forward signal comprises the "odd" wavelength channels and the reverse signal comprises the "even" wavelength channels instead of dividing the channels into two halves in the way disclosed by Kai et al (Giles, Figure 6; column 6, lines 8-11; column 7, lines 29-42).

Regarding claim 8, it would have been obvious to a person of ordinary skill in the art to interleave the forward and reverse signals as taught by Giles in the system disclosed by Kai et al. (and accordingly use first and second interleavers in place of the multiplexers) in order to provide greater spacing between the channels in either direction and thereby reduce negative effects of four wave mixing and facilitate filtering requirements at the receiving end (see Giles, column 6, lines 8-11; column 7, lines 29-42).

Regarding claims 4, 7, and 9, Kai et al. further disclose that the system comprises:

first and second optical amplifiers 104 and 109 provided to an input node and an output node of the add/drop multiplexer 105, respectively (Figure 2); and

a dispersion compensation module (element 120, within uni-directional optical ADM 1, shown in detail in an alternate embodiment in Figure 11; column 32, lines 7-54) provided between the third node (i.e., the output) of the first multiplexer 20 and the input node of the add/drop multiplexer 105, for compensating color dispersion.

Examiner notes that Kai et al. refer to element 120 in Figure 11 as "distribution compensator 120," but although Kai et al. use the term "distribution," it would be well

understood in the art that their specification discloses that element 12 compensates what is more commonly known as dispersion (column 32, lines 7-54). Examiner also notes that Kai et al. refer to element 24 in Figure 1, for example, as a "dispersion compensator" in the figure but use the term "distribution compensator 24" in their specification.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 571-272-3023. The examiner can normally be reached on Monday to Friday, 6:30 to 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M. R. Sedighian

M. R. SEDIGHIAN
PRIMARY EXAMINER